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Adoption of Six Sigma Methodology in Reduction of Needle Stick Injuries

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ABSTRACT-Background: This study focuses on reduction of needle stick injuries in Indraprastha Apollo Hospitals, Delhi. It helped the hospital to understand the difficulties faced by employees and patients while using the needle / sharp objects. **Objective:** To identify the root causes of needle stick injuries and eliminate them by adopting six sigma methodologies. **Results:** It was observed that the number of injuries was aimed to reduce it by 50% during the study period. Through appropriate interventions, it was reduced to 20% in three months. **Conclusion:** By adoption of six sigma approach, there was a significant improvement in awareness levels among the nursing staff which reduced the number of injuries, thereby saving huge costs. Also, the injuries in housekeeping department were reduced to 58% in 2 months.

KEYWORDS: Needle Stick Injuries; Lean Six Sigma; Lean Six Sigma in Hospitals; Waste management in hospitals
Gratitude: Ms. Pritindra Sachdeva, Manager- Quality and Quality team, Indraprastha Apollo Hospitals, Delhi

I INTRODUCTION

Six Sigma has been widely used in many sectors throughout the world. In general, Six Sigma deals with the fact that the process and product variation is usually a strong factor affecting manufacturing lead times, product and process costs, process yields, product quality, and, ultimately, customer satisfaction (Goh T.N et al., 2006). (Linderman et al., 2003) define Six Sigma as ‘an organized and systematic method for strategic process improvement and new product and service development that relies on statistical methods and the scientific method to make dramatic reductions in customer defined defect rates’. The main focus of Six Sigma is to reduce potential variability from processes and products by using a continuous improvement methodology that has the following stages: Define Measure, Analyze, Improve, and Control (DMAIC).

Many hospitals are showing interest in adopting six sigma concepts for addressing various issues such as reduction of medication errors, reduction of discharge turnaround time, etc. Since, needle stick injuries increase the risk towards employee health and safety as well as adds to the cost towards adverse events which in turn affects the patient satisfaction, a project was taken to identify the root causes of such injuries and a specialized team was formed to address this life threatening issue.

II LITERATURE REVIEW

A comprehensive literature review was conducted to understand the difficulties faced by various staff in handling needles and sharp objects; how six sigma has been deployed to address clinical issues in healthcare industry and also about the significance of employee health and safety in any organization. A healthcare customer is a consumer but not a payer. As a result, a healthcare organization may not be rewarded financially for its quality and innovative technology (Lin Guo and Selena, 2012). In July 2000, Mount Carmel Health (Columbus, Ohio) became the first healthcare organization to implement Six Sigma (Lin Guo and Selena, 2012).

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Needle stick Injury (NSI) is defined as a percutaneous piercing wound typically set by a needle point. It may also occur due to sharp instruments or objects which may result in exposure to blood or other body fluids. They are the most common occupational hazard in healthcare sector (UK Essays, 2013). Exposure to blood borne pathogens from sharps injuries continues to pose a significant risk to healthcare workers (J. C. Trim, et.al, 2003). A study conducted at the University of Virginia discusses the retrospective survey analysis among medical students in various departments (Caroline Shen, et. al, 1999). One of the most important occupational risks to healthcare workers is exposure is to blood-borne viruses. A study examined nurses' perceptions of risk of contracting infection following single or multiple exposure to blood or body fluids. The findings of this study suggest that nurses would benefit from education regarding infection from blood-borne viruses (C Leliopoulou, et. al, 1999).

From the literature review, it was well understood that six sigma was not only used in financial and waste reduction cases, but also remains successful in addressing issues related to operational, clinical, service excellence and safety.

III PURPOSE OF STUDY

The main focus of the study is to bring down the number of NSI by studying the underlying causes contributing to such injuries and come out with feasible solutions and to create awareness among nurses with direct impact on housekeeping department. In this study, nearly 1300 nurses across the hospital were targeted to ensure compliance for safe handling of sharp objects.

Thought Leader: Capt. Usha Banerjee, Group Director of Nursing

IV OBJECTIVES OF STUDY

- a. To bring down the NSI by 50% during the study period
- b. To reduce the cost incurred by the hospital per NSI
- c. To improve staff awareness by 85% by conducting various training sessions / campaigns
- d. To practice a continuum for the improvements

Define Phase:

A. Project charter:

Nurses being the largest population in an organization accounts for a vast occupational safety hazard. As they are the direct point of contact to the patients and an active channel of care, the community deserves a safe and healthy environment at work.

For every NSI, each nursing staff exposed gets a Tetanus Toxoid. They also undergo several investigations such as AntiHCV, HbStitre, HbSAg and HIV ELISA. In addition, samples from the known patient source are also sent for investigations. Hence, there is a paramount need of recognizing the underlying causes associated and the safe approaches to cut down the number of such incidences.

B. Voice of the Customer (VOC):

Several interactive sessions and group discussions were conducted to capture the voice of the employees. They were questioned on certain experiences post injury, psychological and clinical consequences faced by them, working conditions during needle use, training status of the staff, mode of injury and usage of personal protective equipment's. In order to enhance employee safety, a study was taken and customized six sigma tools were applied.

C. Defining customers and their requirements (CTQs):

The voice of the employees was used to identify the key issues in the process and then was translated into Critical to Quality (CTQ) needs.

1. Control - High (Proper training, monitoring can appropriately address issues related to NSI)
2. Impact - Very High
3. Quantitative Business Specification (CTQ) - Decreasing NSI and associated cost

Table 1: SIPOC Diagram

| SUPPLIER | INPUT | PROCESS | OUTPUT | CUSTOMER |
|----------|----------------------------|----------------|--|----------|
| Patient | | | Safe Procedures | |
| Employee | Usage of Needle and Sharps | Refer Figure 1 | Enhanced Employee Safety Cost Savings Improved awareness | Employee |

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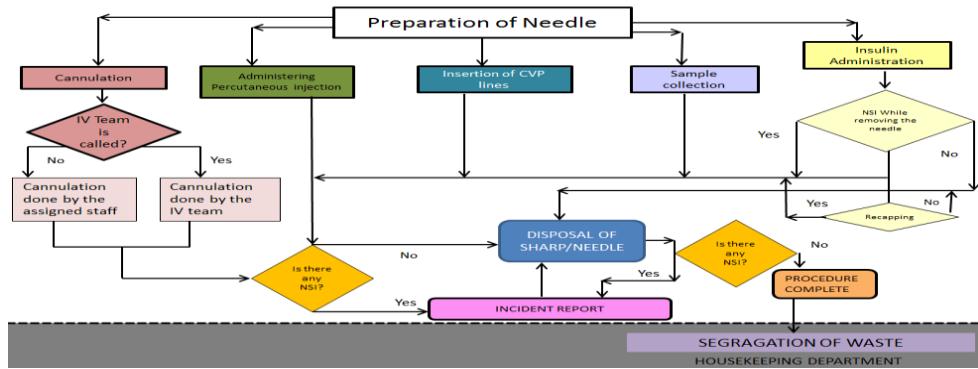


Fig. 1: NSI Process Map

Measure Phase:

Source of Data: The details on NSI were obtained either from staff clinic or nursing quality dashboard. All the incidents of NSI were taken into consideration to study the causes and effects of the same. The overall distribution of NSI across various services is shown in figure 2.

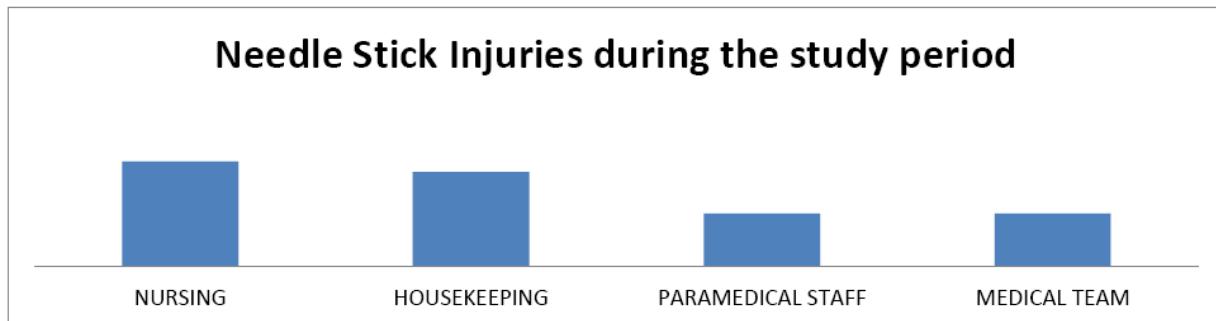


Fig. 2: Distribution of Needle Stick Injuries for given period of time

Analysis Phase:

Unit in charges, nursing supervisors, staff clinic, quality officers, housekeeping staff / employees and management consultant formed an ad hoc group and brainstorming sessions were conducted to discuss the reasons of NSI. Figure 3 shows the fishbone diagram which enumerates the causes of NSI.

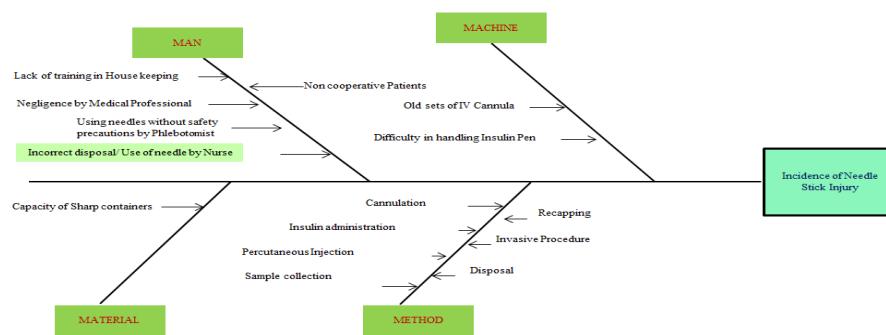


Fig. 3: Fishbone Diagram

A detailed analysis for each category was performed addressing each of the causes. Product validation of insulin pens was done by the research team from registered staff nurses. Figure 4 shows the pareto to analysis to quantify the frequency of the causes.

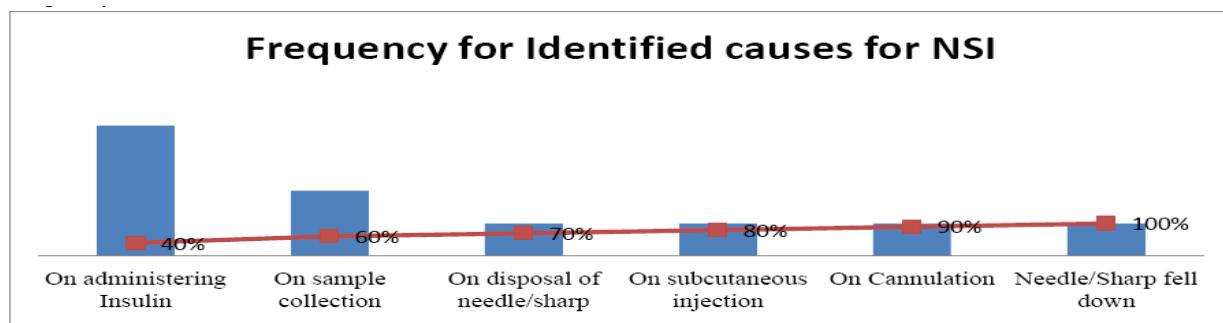


Fig. 4: Pareto Diagram

A scatter plot was used to find out the relationship between the experience of the staff and the number of incidents occurred. It was observed that there was a strong negative correlation of 0.867. Due to high attrition among the staff, as new recruits with less experience were assigned for direct patient care, specific training sessions on waste management, proper handling of sharps were planned for them.

Improvement Phase:

The following causes for NSI were identified and several improvement strategies were implemented.

- Error in waste management practices
- Behavioral patterns of patients
- Recapping
- Incorrect disposal methods
- Lack of concentration
- Difficulty in removing novo fine needle post insulin use

Some of the solutions implemented were:

- Demonstrative sessions for the nurses on correct techniques of handling insulin pens. This helped to reduce the number of NSI caused while removing the needles fixed in the insulin pen.
- Sessions on waste management and safe use of sharps and needles were incorporated in the training curriculum and post training competencies were checked for all the staff as shown in figure 5.
- NSI posters were distributed in all the units highlighting the dos and don'ts.
- Periodic campaigns on awareness of NSI and infection control were organized across the hospital.
- Regular follow up with the staff clinic was done to have an authenticated NSI data.
- Effective communication to the patients explaining the consequences of NSI and their role in employee safety.
- Adhering to the staff-to-patient ratio for all the patient care set-ups. (Wards and ICUs)

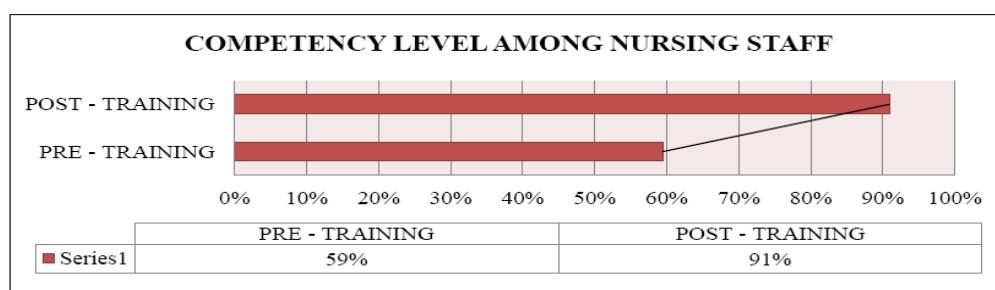


Fig. 5: Competency level among nursing staff

Control Phase:

The data was continuously monitored in this phase and a control plan was developed. Figure 6 shows certain instructions that were followed to prevent NSI and also the steps taken into consideration upon occurrence of any incident.

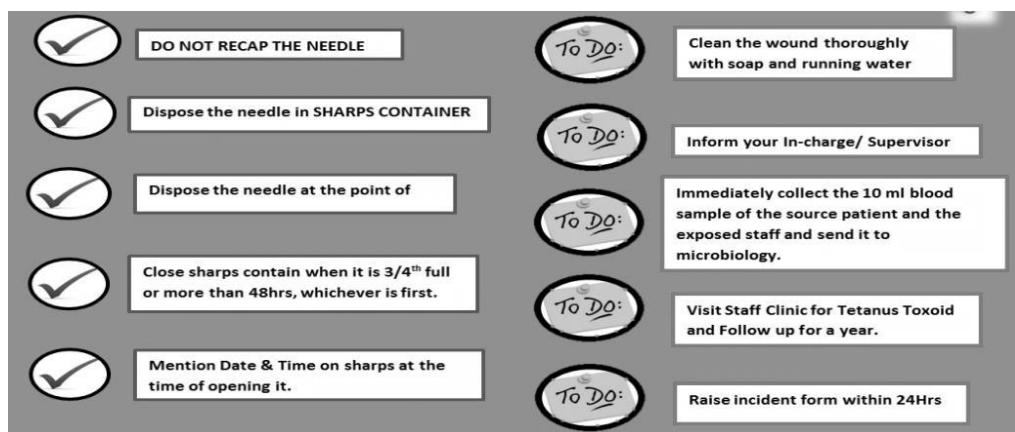


Fig. 6: Safety Tips on Needle Stick Injuries

V RESULTS AND DISCUSSION

By adoption of six sigma approach, there was a reduction in the NSI by 20%. Also, owing to repeated training sessions and periodic competency checks, there was increase in the awareness and knowledge of the nurses by 32%. As a result of awareness, there was 100% reporting of the incidences the same day. This also resulted in timely prophylaxis of the NSI which minimized the transmission of severe blood borne infections. With the reduction in the number of NSI, the cost savings achieved was increased up to 20%. In order to maintain the confidentiality of the data, the hospital details were not disclosed for the study. Further, it has been planned to use the updated cannulas and sharp containers for safe handling and disposal of the needles. This will also show an impact on housekeeping department who play a major role in waste segregation.

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